Keeping Your Head in the Game

Workup and Treatment of Concussion in Sports
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Objectives

• Identify signs and symptoms of a concussion
• Identify current techniques used to evaluate athletes with a concussion
• Discuss potential long term complications of concussion
• Have a working knowledge of return to sport criteria for athletes with a concussion

Epidemiology

• CDC estimates 1.6-3.8 million concussions in the US annually
• In 2000, direct and indirect costs for care of traumatic brain injury were estimated at 60 billion dollars
• Concussion rates have doubled from 0.17/1000 A-Es in 1988-1989 to 0.34/1000 A-Es in 2003-2004
• Underreporting is still significant

Epidemiology

• Increased risk of injury in competition compared to practice
• Female athletes are at greater risk than males for a given sport
• In high school athletes, the majority of concussions occur in football, women’s soccer, men’s soccer, and women’s basketball

North Dakota Law

• Century code 15.1-18.2-04
• Passed in 2011
• Requires each school to have a concussion management plan
• Athlete must be removed from game if suspected of having a concussion
• Athletes cannot return to play without written clearance from a health care provider whose scope of practice includes the diagnosis and treatment of concussion
Diagnosis

- Symptoms
  - Somatic (headache)
  - Cognitive (groggy)
  - Emotional (sadness)
- Physical signs (LOC, amnesia)
- Behavioral changes (irritability)
- Cognitive impairment (slowed reaction times)
- Sleep disturbance (drowsiness)

Diagnosis

- If any features of a concussion are noted:
  - Medical evaluation using EMS principles and attention to possible cervical spine injury
  - Appropriate disposition by health care provider
  - Assessment of concussive injury
  - Close observation and serial monitoring for deterioration
  - No same day return to play!

Glasgow Coma Scale

- Used in initial evaluation
- Most people with concussions score 14 or 15
- Useful only to distinguish more serious injuries

Symptoms Checklist

- Varied tests with 9-25 symptoms
- No “gold standard”
- Concern for underreporting
- Examples could include
  - Headache
  - Balance problems
  - Nausea
  - Sleeping more than usual
  - Drowsiness
  - Fatigue
  - Feeling “slowed down”
  - Feeling as if “in a fog”
  - Difficulty concentrating

Maddocks’ Questions

- Which venue are we at today?
- Which half is it now?
- Who scored last in this game?
- What team did you play last week/game?
- Did your team win the last game?
Standardized Assessment of Concussion

- Measures commonly impaired domains of neuropsychological function
  - Orientation
  - Immediate memory
  - Concentration
  - Delayed recall
- 95% sensitivity
- 76% specificity
- Needs to be done shortly after injury
- Should be compared to baseline

Balance Error Scoring System

- Identifies post concussion balance deficits
- Takes 3-5 minutes
- Best immediately after injury
- Has some inter-rater reliability issues

Sports Concussion Assessment Tool 2

- Developed by International Conference on Concussion in Sport (Zurich Consensus)
- Composite of several evaluations
  - Symptoms Checklist
  - Cognitive and physical evaluation
  - Maddock’s questions
  - GCS
  - Modified BESS
  - SAC
- Should have a baseline test
- Takes about 20 minutes to administer
- Should be used by medical and health professionals only
- No definitive cutoff for the diagnosis of a concussion
Computerized Neurocognitive Testing

- Immediate Post-Concussion Assessment Cognitive Test (ImPACT)
- Axon Sports Computerized Cognitive Assessment Tool (CCAT)
- Vista LifeSciences Automated Neuropsychological Assessment Metrics (ANAM4)

Pros

- Assess many different areas of cognitive function
- Can be administered by nearly anyone
- Correlate with traditional testing
- Do not show “practice effect”

Cons

- Time intensive
- High false positive rate
- High false negative rate
- No algorithm to determine return to play
- No prospective, peer-reviewed, controlled studies
- Costly

Neuroimaging

- CT scans only useful if suspicious for inter-cerebral structural lesion
  - Subdural hemorrhage, skull fracture, etc.
- MRI also generally not helpful
- fMRI, DTI, PET, SPECT, MRS all in early stages of development

Concussion Management

- Communication is key
- Set a time for follow-up
- Explain that rest is both physical and mental (video games, texting)
- Have athlete/parents discuss with teachers
- Describe a timeline of expected recovery

Return to Play
Return to Play

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activity</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>No activity</td>
<td>Physical/cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>Light aerobic exercise</td>
<td>Walking, swimming, stationary bike (&lt;70% MPHR), no resistance</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>Sport-specific exercise</td>
<td>Skating, running, no head impact drills</td>
<td>Add movement</td>
</tr>
<tr>
<td>Non-contact training drills</td>
<td>Increasingly complex drills, may start resistance</td>
<td>Exercise, coordination, cognitive load</td>
</tr>
<tr>
<td>Full contact practice</td>
<td>Normal training activities</td>
<td>Restore confidence, assess functional skills</td>
</tr>
<tr>
<td>Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

Complications

- Second Impact Syndrome
  - Not well understood
  - Sudden increase in intracranial pressure after a second insult in a person already suffering from a concussion
  - Serious neurological deficits or even death

- Postconcussion Syndrome
  - Symptoms lasting for greater than 3 months
  - May have headache, cognitive impairment, mood disturbance
  - Generally requires broad consultation
    - Neuropsychologist
    - Neuroligist
    - Psychiatrist

Challenges

- "This game is almost like a playoff game. It's almost a must-win. I could see some players or teammates questioning, like 'It's just a concussion.' I've played with a concussion before.......I've lied to a couple of doctors saying I'm straight, I feel good when I know that I'm not really straight." – Hines Ward, NFL wide receiver about a teammate’s decision to not play a game in 2009 because of a concussion

Athlete issues

- Parental issues
- Coach issues
- Expanding scientific knowledge

Final Pearls

- Stay up to date
- Have a plan of action
- Develop a team approach
- Have a relationship with coaches
Resources

• Center for Disease Control
  – http://www.cdc.gov/concussion/
• ND High School Activities Association
• ACSM Team Physician Guidelines

References


Questions?

Thank You!